

Geography of Pulmo Park Activity 1A

Activity Objectives:

Students will be able to:

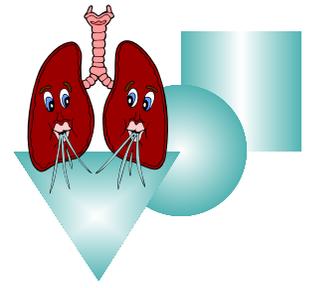
- ★ analyze and interpret information to construct reasonable explanations from direct and indirect evidence.
- ★ identify and describe a task that is done by two or more systems working together.
- ★ describe how the properties of a system are different from the properties of its parts.
- ★ differentiate between structure and function of the pulmonary system.
- ★ identify how structure complements function at different levels of organization including organs, organ systems, and organisms.
- ★ identify the systems of the human organism and describe their functions.
- ★ assess their own lung health
- ★ discuss health concerns of the lungs
- ★ write a narrative about personal lung health

Extension:

- ★ use productivity tools to create effective document files for defined audiences such as slide shows, posters, multimedia presentations, newsletters, brochures, or reports.

Activity Description:

As an introduction to the *“Geography of Pulmo Park”*, students will explore the structure of the pulmonary system with an activity called *“Landmarks”*. After becoming acquainted with the structure of the pulmonary system, students will be further engaged by completing a self-profile of their own pulmonary health called, *“My Road Blocks”*. This activity will allow students to explore the functions of the lungs and how the health of our lungs is affected by many interrelating factors. After assessing personal health risks related to their lungs, students will process out this activity through a student discourse of questioning called *“Clearing My Road Blocks”* which will expand and deepen thinking and allow for thoughtful reflection. This thoughtful reflection will be manifested in the writing of a narrative called *“Fortunately, Unfortunately”* where students describe the condition of their lungs and have the option to extend this activity in a creative collage of the lungs called *Street Media*.



Activity Overview



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Activity Background for Landmarks:

(In this activity, students will further develop their basic understanding of the respiratory system. In the Landmarks activity, important vocabulary is reviewed by completing the activity. On the flipside of each game piece is a picture, students will quickly see where these fit into a large diagram of the respiratory system).

Can you imagine that each day we breathe in about 20,000 times and by the time we're 70 years old, we will have taken at least 600 million breaths? Breathing could not take place without the respiratory system and its vital parts. Chief among these parts are the *lungs* (lungz).

The lungs are divided into *lobes* (lowbz) and work closely with the heart for pulmonary circulation at the *hilum* (hy-lum). The *hilum* (formerly called a *hilus*) is a depression or pit in an organ where structures such as blood vessels and nerves enter. The *heart* (hart) and lungs are attached to the *mediastinum* (me-dee-ass-ti-num), and are protected by the *ribs* (ribz). The ribs attach to the backbone and *sternum* (stir-num) which is in the front, center chest, forming a protective cage. With every breath, we take in oxygen-rich air through our nose and mouth and our lungs fill up. Oxygen passes out of the lungs into *capillaries* (kah-puh-ler-eez) found deep within the lungs. Once in the bloodstream, oxygen binds to red blood cells and moves through the *pulmonary veins* (pul-ma-near-ie veins) to the heart. The heart pumps the oxygen-rich blood out to all parts of the body. Body cells use the oxygen from the blood and release carbon dioxide waste, which is carried back to the heart. The *pulmonary arteries* (pul-ma-near-ie r-te-rees) carry oxygen-poor blood to the lungs, where carbon dioxide is released and breathed out.

Living things are arranged according to *levels of organization*. The most basic level of organization is the *cell*. In a living thing made of more than one cell, cells can organize into *tissues* to do a specific job. For examples, blood cells can organize themselves into blood tissue. In more complex living things, tissues can organize into *organs* and work together to do a particular job. For example, blood tissue, muscle tissue, and nerve tissue form a heart, an organ that pumps blood to all parts of the body. Finally, in very complex living things, organs work together as *systems* to accomplish a particular job. Many systems working together form a living *organism*. See *Figure 1*.

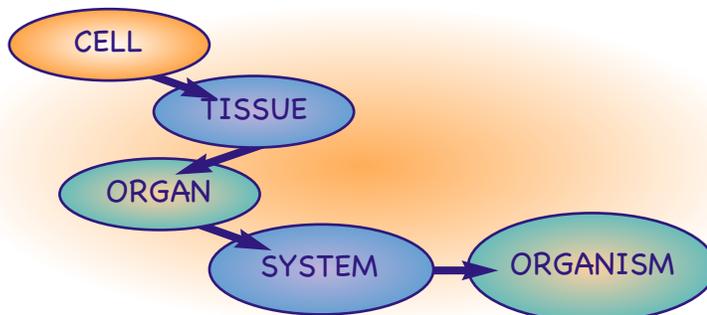
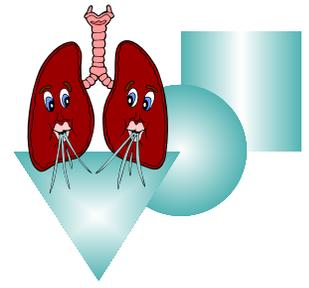


Figure 1 Levels of Organization



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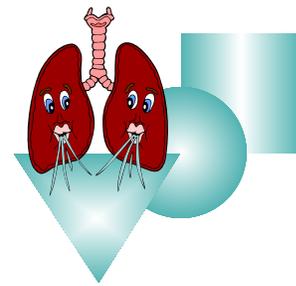


A **system** is defined as a group of independent but interrelated parts that work together as a whole for a common purpose. For example, the **heart, blood, and blood vessels** make up the **circulatory system**. The **heart** is an organ with its own job (function); to pump blood. The **blood** also has its own job, which is to carry nutrients, oxygen, and carbon to fight infections, etc. The **blood vessels** carry blood from one part of the body to the other. Each does its job well, but without the other parts, none can do the whole job of the circulatory system – it takes all working together. Similarly, the **Respiratory System** is made of its own parts working together to accomplish the job of respiration. In a wonderful display of cooperation, these two systems with their own **structure** (design) and **functions** (jobs), work closely together to supply oxygen and to remove wastes from all parts of the body. If we didn't breathe, we couldn't live. It's one of the most important functions our bodies perform.

At the top of the respiratory system, the **nostrils** (nas-strels) act as the air intake, bringing air into the nose, where it's warmed and humidified. The **sinuses** are located behind the nostrils and are actually air pockets located inside the bones in the skull. They are lined with tiny hairs called **cilia** (sih-lee-uh) that protect the nasal passageways and other parts of the respiratory tract, filtering out dust and other particles that enter the nose with the air. **Mucus** (mu-cus) along the passageways also helps to filter the air. **Lymph nodes** (lim-fa nouwdz) line the respiratory pathway, starting at the back of the throat behind the nose with the bacteria removing nodes called **adenoids** (a-dee-noiz) and **tonsils** (taun-suls).

Air can also be taken in through the **mouth** (mow-th). The nasal cavity and the mouth meet at the **pharynx** (far-inks), or throat, at the back of the nose and mouth. The pharynx is part of the digestive system as well as the respiratory system because it carries both food and air. At the bottom of the pharynx, this pathway splits, with one pathway for food (the **esophagus**, (ih-sah-fuh-gus), which leads to the stomach) and the other (**trachea**) for air. The **epiglottis** (eh-pih-glah-tus), a small flap of tissue, covers the air-only passage when we swallow, keeping food and liquid from going into our lungs.

The **larynx** (lar-inks), or voice box, is the uppermost part of the air-only pipe. This short tube contains a pair of vocal cords, which vibrate to make sounds. The **trachea** (tray-kee-uh), or windpipe, extends downward from the base of the larynx. It lies partly in the neck and partly in the chest cavity. The walls of the trachea are strengthened by stiff rings of cartilage to keep it open. The trachea is also lined with cilia, which sweep fluids and foreign particles out of the airway so that they stay out of the lungs.



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At its bottom end, the trachea divides into left and right air tubes called *bronchi* (brahn-ky), which connect to the lungs. Within the lungs, the bronchi branch into smaller bronchi and even smaller tubes called *bronchioles* (brahn-kee-olz). Bronchioles end in tiny air sacs called *alveoli* (al-vee-oh-lie), where the exchange of oxygen and carbon dioxide actually takes place. Each lung houses about 300 to 400 million alveoli. The lungs also contain elastic tissues that allow them to inflate and deflate without losing shape. The lungs are also encased by a thin lining called the *pleura* (plur-uh). This network of alveoli, bronchioles, and bronchi is known as the bronchial tree. The pleura acts to protect the lungs just as the pericardium (*per-i-kar-de-um*) protects the heart.

The chest cavity, or *thorax* (thor-aks), is the airtight box that houses the bronchial tree, lungs, heart, and other structures. The top and sides of the thorax are formed by the ribs and attached muscles, and the bottom is formed by a large muscle called the diaphragm. The chest walls form a protective cage around the lungs and other contents of the chest cavity. Separating the chest from the abdomen, the *diaphragm* (die-uh-fram) plays a lead role in breathing. It moves downward when we breathe in, enlarging the chest cavity and pulling air in through the nose or mouth. When we breathe out, the diaphragm moves upward, forcing the chest cavity to get smaller and pushing the gases in the lungs up and out of the nose and mouth. See *Figure 2* for these Landmarks.

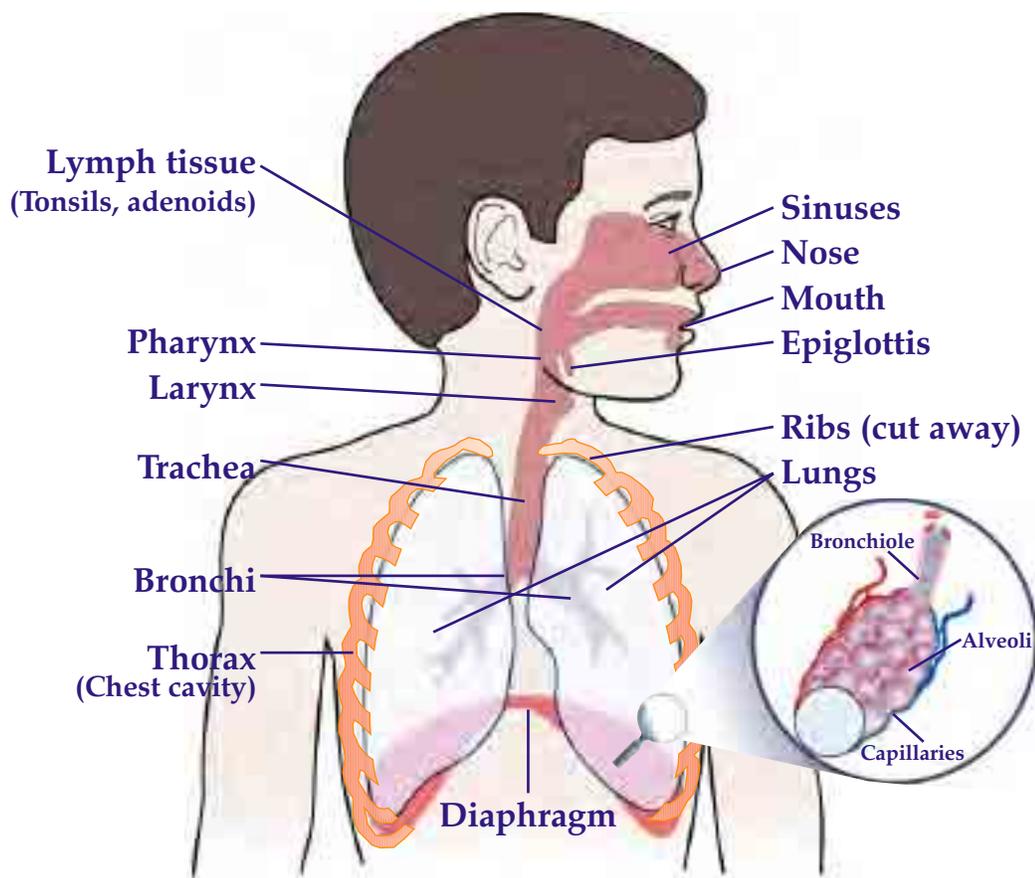
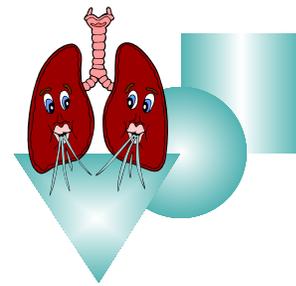


Figure 2 Landmarks of the Respiratory System



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Background information for “Road Blocks” (In a personal self-assessment, students will use a Likert Scale to determine what “road blocks” might be causing poor lung health. A review of the respiratory system is included below as well as information on “My Road Blocks”. In addition to this background information, a flash animation are available to use in teaching these concepts to students (see references). Students will “process out” this activity by answering a series of questions related to “My Road Blocks”. After a class discussion on the questions called “Clearing My Road Blocks”, students will write a personal narrative on lung health called “Unfortunately, Fortunately” that explains the findings on the Likert Scale as well as reflects a use of the vocabulary. Evaluate using the “Landmarks Rubric”.)

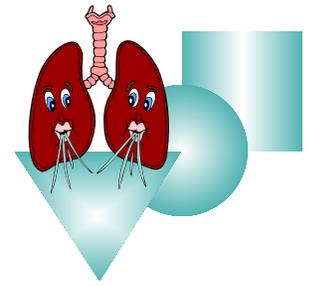
Pulmonary Health

Did you know that the lungs age? An average person continues to slowly make new alveoli until about age 20. After this age, the lungs begin to lose some of their tissue. The number of alveoli decreases, and there is a corresponding decrease in lung capillaries. The lungs also become less elastic due to various factors including the loss of a tissue protein called *elastin*.

Structural changes occur in the respiratory system with advancing age. Lung elasticity decreases, stiffness of the chest wall increases, and respiratory muscle strength declines. These aging processes contribute to gradual, but progressive, reductions in the amount of air moved in and out of the lungs and the ability of the lungs to exchange carbon dioxide for oxygen. Although the aging process of the lungs is directly related to individual differences, cigarette smoking accelerates the age-related decline in the ability of lungs to function properly. Understanding the effects of aging on the lung is important in order to distinguish *pathologic changes* (changes brought on by smoking or disease) from changes that are part of the normal aging process.

Maximum lung function decreases with age. The amount of oxygen diffusing from the air sacs into the blood decreases, the rate of air flow through the airways slowly declines after age 30, and the maximal force one is able to achieve on inspiration and expiration decreases. Usual breathing should remain adequate, and even a very old person should, under most circumstances, be able to breathe without effort. However, when there is a need for increased breathing, the lungs may not be able to keep up with the demand. As aging continues, there may be a decreased capacity for exercise, and high altitude may cause problems.

As reported by the *World Health Organization*, globally more than 1.5 million deaths annually from respiratory infections are attributable to the *environment*, including at least 42% of lower respiratory infections and 24% upper respiratory infections in developing countries. Respiratory infections are one of the biggest killers of children under the age of five. Most of these diseases are preventable because they are by-products of a polluted environment.



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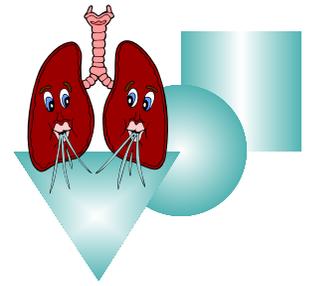
Even if the air we breathe is dirty or polluted, our respiratory system along with our immune system can defend against foreign matter and/or organisms that enter through the nose and mouth. Pollutants are trapped by hair or mucus, breathed out again, coughed up, swallowed, passed out through the intestines or destroyed by digestive juices, or destroyed by macrophages (a type of blood cell that patrols the body looking for germs to destroy). But when this system fails, things can go wrong in the respiratory system.

The respiratory system is susceptible to a number of diseases, and the lungs are prone to a wide range of disorders caused by pollutants in the air. Sometimes these diseases are noted throughout family history.

More than 20 million people in the United States have *asthma* (az-muh), and it's the number-one reason students chronically miss school. Asthma is a *chronic inflammatory lung disease* that causes airways to tighten and narrow. Often triggered by irritants in the air such as cigarette smoke, asthma flares involve contraction and swelling of the muscles around the tiny airways. The resulting narrowing of the airways prevents air from flowing properly, causing wheezing and difficulty breathing, sometimes to the point of being life-threatening. Management of asthma starts with an asthma management plan, which usually involves avoiding asthma triggers and sometimes taking medications.

Chronic obstructive pulmonary disease (COPD). *COPD* is a term that describes two lung diseases - *emphysema* and *chronic bronchitis*. Long-term smoking often causes *emphysema* (em-fuh-zee-muh), and although it seldom affects children and teens, it's a condition that can have its roots in the teen and childhood years. Talking to students about tobacco smoke is a key part of preventing smoking-related diseases like emphysema and lung cancer. With *emphysema*, the lungs produce an excessive amount of mucus, and the alveoli become damaged. It becomes difficult to breathe and get enough oxygen into the blood. With *bronchitis* (brahn-ky-tus), a common disease of adults and adolescents, the membranes lining the larger bronchial tubes become inflamed, and an excessive amount of mucus is produced. The person develops a bad cough to get rid of the mucus. *Cigarette smoking* is a major cause of chronic bronchitis in teens.

Other diseases such as the *common cold* (caused by over 200 different viruses), *influenza*, *cystic fibrosis*, and *pneumonia* also contribute greatly to respiratory problems. But, no disease is scarier than *lung cancer*. Caused by an abnormal growth of cells in the lungs, lung cancer is a leading cause of death in the United States and is often caused by smoking cigarettes or breathing second-hand smoke. It starts in the lining of the bronchi, and takes a long time to develop. Symptoms include a persistent cough that may bring up blood, chest pain, hoarseness, and shortness of breath.



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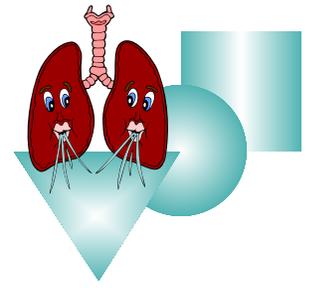


Apnea is a medical term that means someone has stopped breathing. *Apnea of prematurity* (AOP) is a condition in which premature infants stop breathing for 15 to 20 seconds during sleep. Apnea of prematurity generally occurs after 2 days of life and up to a week of life. The lower the infant's weight and level of prematurity at birth, the more likely the child is to have AOP spells. *Sleep apnea* affects teens and adults. The most common type of sleep apnea is obstructive sleep apnea, which happens when the upper airway gets blocked during sleep. Most often, the blockage happens when the soft tissue in the back of the throat collapses and closes during sleep. Relaxed throat muscles, a narrow airway, a large tongue or extra fatty tissue in the throat can also block the airway. Central apnea and mixed apnea are other types of sleep apnea, but are rarer. In central sleep apnea the part of the brain that controls breathing doesn't work properly. Sleep apnea is a serious disorder that causes your breathing to stop repeatedly while you sleep. These breathing pauses or "apneas" usually last 10 to 30 seconds and can happen many times throughout the night. Apnea can cause depression, hypertension, daytime sleepiness, loud snoring, gasping or choking during sleep, morning headache, mood changes, poor concentration, etc.

Air quality has long been the one factor in respiratory disease that can be preventable. The *Environmental Protection Agency* (EPA) daily issues reports on the air quality surrounding most major cities (<https://www.airnow.gov>). The *air quality index* gives an indicator of the amounts of particulates and ozone in the air that can cause problems for people with respiratory problems. It has been found that a diet rich in vegetables and fruits (especially those rich in vitamin C) or other antioxidant rich foods can help provide resilience in people with respiratory problems. Dr. James Samet of the United States EPA said, "If we can't decrease ozone levels, perhaps we can do something to increase resistance in the population."

Exercise is an important part of a healthy life. If your cardiovascular and pulmonary systems are in shape, they can work much more efficiently. You're stronger and can do more before you feel tired. Your exercises don't have to be fancy or complicated, but they do have to be performed safely and on a regular basis. Even a small amount of exercise is better than none at all.

Although some respiratory diseases can't be prevented, students can prevent many chronic lung and respiratory illnesses by *avoiding smoking, staying away from pollutants and irritants, washing hands* often to avoid infection, and *getting regular medical checkups*.



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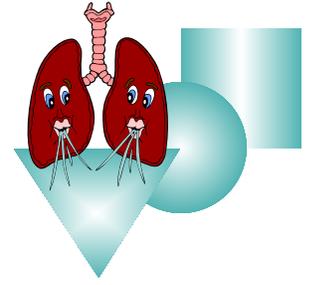
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Activity Instructions:

1. Find a poster or other representation of the respiratory system as a teaching aid (check reference section).
2. Read teacher background to be familiar with information that supports this project.
3. Copy *Landmarks Background Response Page* for students. (They can respond on their own paper to save copies.)
4. Copy a class set of the *Landmarks* cards and game board to use for group game. Copy extras as needed for student modifications.
5. Make individual copies of *My Road Blocks* for each student.
6. Make individual copies of *Clearing My Road Blocks* a question sheet for students.
7. Lead a class discussion answering questions on *Clearing My Road Blocks* and see a slide show and/or flash animation.
8. Review the standards for evaluation in the *Landmarks Rubric*.
9. Make a copy of *Fortunately, Unfortunately* for each student.
10. Allow for computer time for extension work on *Street Media*.

Activity Management Suggestions:

1. The activity called *Landmarks* is designed to be done as a group activity. The landmarks are important vocabulary terms used for identifying structural parts of the pulmonary system. On the back of each card is a diagram which helps to complete a large, projected image of the respiratory system. As students review the vocabulary through linking, they will place the word in the matching area on the projected image of the respiratory system.
2. Read through the teacher information and allow students to match up the vocabulary to projected image of the pulmonary system. This is your trial run.
3. After this, one student can begin the game by reading the second sentence on their card (My word means.....) and the student with the corresponding word will then read (Your word is.....) and continue to read (My word means.....). When the second person reads (Your word is.....), if the card has a star on the image side, that student places the card on the projected image in its correct location.



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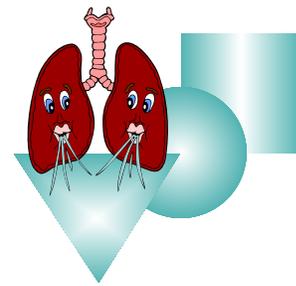
4. Assist students the first time in trying to match the vocabulary but then allow them to “take over” the game. Observe and listen as each student becomes involved in learning the vocabulary. Allow student several times to get the rotation correct. Then, shuffle the cards, hand out to different students and play again. It may be to the teacher’s advantage to allow students to rotate through the words several times and then attempt to match up to the projected image.
5. After playing *Landmarks*, students will complete the self-assessment called *My Road Blocks*. Hand out the assessments and read the directions to the students. Before allowing them to check off their answers, read to them the teacher background information, then ask them to complete the self-assessment. After completion, have them total the points and read the description of their total points.
6. Have students transition into the questions, *Clearing My Road Blocks*. Discuss these questions in relation to the self-assessment and the teacher background information. Students will process out of this activity by creating a narrative called *Fortunately, Unfortunately*.
7. In this narrative, students will write about the fortunate and unfortunate circumstances surrounding their lung health – be sure for the “unfortunate” issues, students discuss how they can turn them into “fortunate” issues relating to their health. Review the *Fortunately, Unfortunately Rubric* that is included so that students will be aware of the standards for evaluation.
8. The teacher may choose to give students the option to extend this activity in a creative collage of the lungs called *Street Media*.

Extensions/Modifications:

A teacher can make several sets of the Landmarks cards so that individual students who need extra time learning the vocabulary of this activity may have their own set of cards to study.

Some of the special needs students may choose to do the Street Media project as a means for processing out of the assignment instead of writing the narrative, *Fortunately, Unfortunately*.

Many *Street Media* projects can be entered into national contests. Provide this opportunity for students who excel in this activity.



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Activity Reference Used:

Health Central. (2005). How does the lung age? Retrieved July 18, 2006 from <http://www.healthcentral.com/ency/408/004011.html>

Johnson, Jinny. (1998). Under the Microscope-Breathing: How we use air. Connecticut: Grolier Educational.

Kidshealth Organization. (2005). The Respiratory System. Retrieved July 14, 2006 from

Loewen, Verna. "Inside the Body: The Respiratory System." Canada's Digital Collections. May 2006. Saskatchewan Lung Association. 30 Jun 2006

Mahler, D.A. (1986). The Aging Lung. *Clinics in Geriatric Medicine*. 2 (2), 215-25.

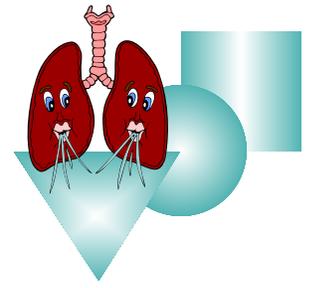
Nagel, Ron. (2002). Body By Design. Volume 2: The Respiratory System. Connecticut: UXL-An Imprint of the Gale Group.

Positively Aging. (2006, May). Anatomy of Breathing Flash Animation. Retrieved July 16, 2006 from

Positively Aging. (2006, May). Pollutants Over Time: Long Term Data Collection w/ slide show. Retrieved July 16, 2006 from

Walker, Richard. (2002). Encyclopedia of the Human Body. New York, NY: DK Publishing Inc.

World Health Organization. (2005) World Health Report. Retrieved from <http://www.who.int/en/>



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Useful References:

American Association for Respiratory Care
<http://www.aarc.org/>

American Lung Association
www.lungusa.org

American Medical Association
www.ama-assn.org

American Thoracic Society
<http://www.thoracic.org/>

Breathing Better and Living Well

Center of Disease Control and Prevention
<http://www.cdc.gov/>

Environmental Protection Agency
<http://epa.gov>

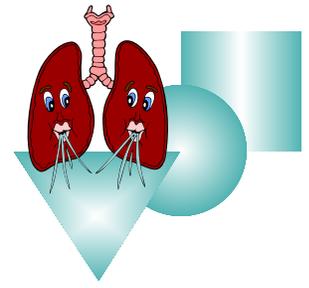
JAMA Patient Pages
www.ama-assn.org/consumer.htm

Journal of the American Medical Association
www.jama.com

Kids Health
<http://www.kidshealth.org>

National Heart, Lung and Blood Institute
<http://www.nhlbi.nih.gov/>

World Health Organization (publication and graphs)
<http://www.who.int/en/>



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